**APPENDIX A**
**Number of Engines per Boat**
**(From EEA Report)**

| Type | Length | Percent of Category | Number of Engines |
|---|---|---|---|
| INBOARDS | 0 - 16 feet | 100 | 1 |
| | 16 - 26 feet | 100 | 1 |
| | 26 - 40 feet | 32<br>68 | 1<br>2 |
| | 40 - 65 feet | 100 | 2 |
| | > 65 feet | 100 | 2 |
| OUTBOARDS | 0 - 16 feet | 100 | 1 |
| | 16 - 26 feet | 90<br>10 | 1<br>2 |
| | 26 - 40 feet | 90<br>10 | 2<br>3 |
| | 40 - 65 feet | * | * |
| | > 65 feet | * | * |
| INBOARD/ OUTBOARD | 0 - 16 feet | 100 | 1 |
| | 16 - 26 feet | 50<br>50 | 1<br>2 |
| | 26 - 40 feet | 20<br>80 | 1<br>2 |
| | 40 - 65 feet | 5<br>95 | 2<br>3 |
| | > 65 feet | 100 | 3 |
| SAIL AUXILIARY INBOARD | 0 - 16 feet | 100 | 1 |
| | 16 - 26 feet | 100 | 1 |
| | 26 - 40 feet | 100 | 1 |
| | 40 - 65 feet | 99<br>1 | 1<br>2 |
| | > 65 feet | 98<br>2 | 1<br>2 |

* These two classes were determined to be barge-type vessels or house-boats, vessels with limited usage levels. Consequently, they were excluded from this study.

## APPENDIX B
## Growth Factors for Pleasure Craft

| Equipment Type | Fuel/ Cycle | Calendar Year | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Vessels w/Outboard Engines | G2 | 1 | 1.019 | 1.006 | 0.996 | 0.987 | 0.985 | 0.980 | 0.970 | 0.966 | 0.962 | 0.957 | 0.953 | 0.949 | 0.945 | 0.940 | 0.936 | 0.932 | 0.928 | 0.924 | 0.920 | 0.916 |
| Sailboat Auxiliary Outboard Engines | G2 | 1 | 0.989 | 0.965 | 0.938 | 0.914 | 0.896 | 0.881 | 0.861 | 0.843 | 0.825 | 0.807 | 0.790 | 0.773 | 0.757 | 0.741 | 0.725 | 0.709 | 0.694 | 0.679 | 0.665 | 0.651 |
| Personal Water Craft | G2 | 1 | 1.157 | 1.306 | 1.452 | 1.632 | 1.902 | 2.173 | 2.388 | 2.388 | 2.388 | 2.388 | 2.388 | 2.388 | 2.706 | 3.066 | 3.473 | 3.935 | 4.010 | 4.086 | 4.164 | 4.243 |
| Vessels w/Inboard Engines | G4 | 1 | 1.025 | 1.034 | 1.051 | 1.067 | 1.092 | 1.116 | 1.132 | 1.152 | 1.173 | 1.194 | 1.215 | 1.237 | 1.259 | 1.281 | 1.304 | 1.327 | 1.351 | 1.375 | 1.400 | 1.425 |
| Vessels w/Outboard Engines | G4 | 1 | 1.019 | 1.006 | 0.996 | 0.987 | 0.985 | 0.980 | 0.970 | 0.966 | 0.962 | 0.957 | 0.953 | 0.949 | 0.945 | 0.940 | 0.936 | 0.932 | 0.928 | 0.924 | 0.920 | 0.916 |
| Sailboat Auxiliary Inboard Engines | G4 | 1 | 0.989 | 0.965 | 0.938 | 0.914 | 0.896 | 0.881 | 0.861 | 0.843 | 0.825 | 0.807 | 0.790 | 0.773 | 0.757 | 0.741 | 0.725 | 0.709 | 0.694 | 0.680 | 0.665 | 0.651 |
| Vessels w/Inboard/Outboard | G4 | 1 | 1.019 | 1.027 | 1.038 | 1.052 | 1.076 | 1.099 | 1.117 | 1.135 | 1.153 | 1.172 | 1.191 | 1.210 | 1.229 | 1.249 | 1.269 | 1.289 | 1.310 | 1.331 | 1.352 | 1.374 |
| Vessels w/Inboard Jet Engines | G4 | 1 | 0.998 | 0.987 | 0.978 | 0.969 | 0.967 | 0.967 | 0.973 | 0.969 | 0.965 | 0.961 | 0.957 | 0.953 | 0.950 | 0.946 | 0.942 | 0.938 | 0.934 | 0.931 | 0.927 | 0.923 |
| Vessels w/Inboard Engines | D | 1 | 1.025 | 1.034 | 1.051 | 1.067 | 1.092 | 1.116 | 1.132 | 1.152 | 1.173 | 1.194 | 1.215 | 1.237 | 1.259 | 1.281 | 1.304 | 1.327 | 1.351 | 1.375 | 1.400 | 1.425 |
| Sailboat Auxiliary Inboard Engines | D | 1 | 0.989 | 0.965 | 0.938 | 0.914 | 0.896 | 0.881 | 0.861 | 0.843 | 0.825 | 0.807 | 0.790 | 0.773 | 0.757 | 0.741 | 0.725 | 0.709 | 0.694 | 0.679 | 0.665 | 0.651 |

## Appendix C
## Allocation Data for Pleasure Craft

ALLOCATE.DAT 7/30/97
(Altered on 9/8/97 to exclude non-pleasure craft categories)
This file is for allocation data adapted from SAI's Pleasure Craft Emissions Model (PCEM). The counties in more than one air basin were split in the same proportion as the off-road model data were split between air basins. Kern county was split 50/50. If there were no diesel powered vehicles in the off-road model, then the G4 splits were used.
The format is as follows:

| FIPS | Air Basin | ASC Code | Fuel Consumption Fraction | HPmn | HPmx |
|---|---|---|---|---|---|
| ALLOCATION/ | | | | | |
| 6001 | San Francisco Bay Area | 2282005000 | 0.010079712 | 0 | 9999 |
| 6001 | San Francisco Bay Area | 2282010000 | 0.010208366 | 0 | 9999 |
| 6001 | San Francisco Bay Area | 2282020000 | 0.007231039 | 0 | 9999 |
| 6003 | Great Basin Valley | 2282005000 | 0.001365955 | 0 | 9999 |
| 6003 | Great Basin Valley | 2282010000 | 0.001417163 | 0 | 9999 |
| 6003 | Great Basin Valley | 2282020000 | 0.001102733 | 0 | 9999 |
| 6005 | Mountain Counties | 2282005000 | 0.00769259 | 0 | 9999 |
| 6005 | Mountain Counties | 2282010000 | 0.003189966 | 0 | 9999 |
| 6005 | Mountain Counties | 2282020000 | 0.002494709 | 0 | 9999 |
| 6007 | Sacramento Valley | 2282005000 | 0.011219982 | 0 | 9999 |
| 6007 | Sacramento Valley | 2282010000 | 0.006341147 | 0 | 9999 |
| 6007 | Sacramento Valley | 2282020000 | 2.82011E-05 | 0 | 9999 |
| 6009 | Mountain Counties | 2282005000 | 0.030790662 | 0 | 9999 |
| 6009 | Mountain Counties | 2282010000 | 0.006699563 | 0 | 9999 |
| 6009 | Mountain Counties | 2282020000 | 0.005061727 | 0 | 9999 |
| 6011 | Sacramento Valley | 2282005000 | 0.002610439 | 0 | 9999 |
| 6011 | Sacramento Valley | 2282010000 | 0.000283306 | 0 | 9999 |
| 6011 | Sacramento Valley | 2282020000 | 0.000245855 | 0 | 9999 |
| 6013 | San Francisco Bay Area | 2282005000 | 0.018086976 | 0 | 9999 |
| 6013 | San Francisco Bay Area | 2282010000 | 0.029980285 | 0 | 9999 |
| 6013 | San Francisco Bay Area | 2282020000 | 0.023500878 | 0 | 9999 |
| 6015 | North Coast | 2282005000 | 0.00061852 | 0 | 9999 |
| 6015 | North Coast | 2282010000 | 0.001043488 | 0 | 9999 |
| 6015 | North Coast | 2282020000 | 4.5194E-06 | 0 | 9999 |
| 6017 | Lake Tahoe | 2282005000 | 0.003058155 | 0 | 9999 |
| 6017 | Lake Tahoe | 2282010000 | 0.006498877 | 0 | 9999 |
| 6017 | Lake Tahoe | 2282020000 | 0.004987451 | 0 | 9999 |
| 6017 | Mountain Counties | 2282005000 | 0.008026484 | 0 | 9999 |
| 6017 | Mountain Counties | 2282010000 | 0.017057061 | 0 | 9999 |
| 6017 | Mountain Counties | 2282020000 | 0.013090147 | 0 | 9999 |

| | | | | | |
|---|---|---|---|---|---|
| 6019 | San Joaquin Valley | 2282005000 | 0.015210925 | 0 | 9999 |
| 6019 | San Joaquin Valley | 2282010000 | 0.009331958 | 0 | 9999 |
| 6019 | San Joaquin Valley | 2282020000 | 0.007231039 | 0 | 9999 |
| 6021 | Sacramento Valley | 2282005000 | 0.002226909 | 0 | 9999 |
| 6021 | Sacramento Valley | 2282010000 | 0.000121666 | 0 | 9999 |
| 6021 | Sacramento Valley | 2282020000 | 7.05026E-07 | 0 | 9999 |
| 6023 | North Coast | 2282005000 | 0.002776912 | 0 | 9999 |
| 6023 | North Coast | 2282010000 | 0.000540153 | 0 | 9999 |
| 6023 | North Coast | 2282020000 | 2.40432E-06 | 0 | 9999 |
| 6025 | Southeast Desert | 2282005000 | 0.002077997 | 0 | 9999 |
| 6025 | Southeast Desert | 2282010000 | 0.008489814 | 0 | 9999 |
| 6025 | Southeast Desert | 2282020000 | 0.010846559 | 0 | 9999 |
| 6027 | Great Basin Valley | 2282005000 | 0.000354939 | 0 | 9999 |
| 6027 | Great Basin Valley | 2282010000 | 8.59831E-05 | 0 | 9999 |
| 6027 | Great Basin Valley | 2282020000 | 6.68871E-05 | 0 | 9999 |
| 6029 | Southeast Desert | 2282005000 | 0.00408653 | 0 | 9999 |
| 6029 | Southeast Desert | 2282010000 | 0.006625246 | 0 | 9999 |
| 6029 | Southeast Desert | 2282020000 | 0.009038799 | 0 | 9999 |
| 6029 | San Joaquin Valley | 2282005000 | 0.00408653 | 0 | 9999 |
| 6029 | San Joaquin Valley | 2282010000 | 0.006625246 | 0 | 9999 |
| 6029 | San Joaquin Valley | 2282020000 | 0.009038799 | 0 | 9999 |
| 6031 | San Joaquin Valley | 2282005000 | 0.000354262 | 0 | 9999 |
| 6031 | San Joaquin Valley | 2282010000 | 8.59831E-05 | 0 | 9999 |
| 6031 | San Joaquin Valley | 2282020000 | 6.68871E-05 | 0 | 9999 |
| 6033 | Lake County | 2282005000 | 0.020470715 | 0 | 9999 |
| 6033 | Lake County | 2282010000 | 0.033628679 | 0 | 9999 |
| 6033 | Lake County | 2282020000 | 0.027116397 | 0 | 9999 |
| 6035 | Northeast Plateau | 2282005000 | 0.006394984 | 0 | 9999 |
| 6035 | Northeast Plateau | 2282010000 | 0.000963359 | 0 | 9999 |
| 6035 | Northeast Plateau | 2282020000 | 4.5194E-06 | 0 | 9999 |
| 6037 | South Coast | 2282005000 | 0.163519972 | 0 | 9999 |
| 6037 | South Coast | 2282010000 | 0.117832972 | 0 | 9999 |
| 6037 | South Coast | 2282020000 | 0.154436342 | 0 | 9999 |
| 6037 | Southeast Desert | 2282005000 | 0.001091644 | 0 | 9999 |
| 6037 | Southeast Desert | 2282010000 | 0.000786642 | 0 | 9999 |
| 6037 | Southeast Desert | 2282020000 | 0.001031002 | 0 | 9999 |
| 6039 | San Joaquin Valley | 2282005000 | 0.010930685 | 0 | 9999 |
| 6039 | San Joaquin Valley | 2282010000 | 0.01260203 | 0 | 9999 |
| 6039 | San Joaquin Valley | 2282020000 | 0.010846559 | 0 | 9999 |
| 6041 | San Francisco Bay Area | 2282005000 | 0.02825297 | 0 | 9999 |
| 6041 | San Francisco Bay Area | 2282010000 | 0.008374651 | 0 | 9999 |
| 6041 | San Francisco Bay Area | 2282020000 | 0.007212962 | 0 | 9999 |
| 6043 | Mountain Counties | 2282005000 | 0.019286459 | 0 | 9999 |

**Appendix C (Continued)**

**Allocation Data for Pleasure Craft**

| | | | | | |
|---|---|---|---|---|---|
| 6043 | Mountain Counties | 2282010000 | 0.002791022 | 0 | 9999 |
| 6043 | Mountain Counties | 2282020000 | 0.002169312 | 0 | 9999 |

| | | | | | |
|---|---|---|---|---|---|
| 6045 | North Coast | 2282005000 | 0.010083096 | 0 | 9999 |
| 6045 | North Coast | 2282010000 | 0.006300619 | 0 | 9999 |
| 6045 | North Coast | 2282020000 | 0.00497134 | 0 | 9999 |
| 6047 | San Joaquin Valley | 2282005000 | 0.004630611 | 0 | 9999 |
| 6047 | San Joaquin Valley | 2282010000 | 8.59831E-05 | 0 | 9999 |
| 6047 | San Joaquin Valley | 2282020000 | 6.68871E-05 | 0 | 9999 |
| 6049 | Northeast Plateau | 2282005000 | 1.40402E-05 | 0 | 9999 |
| 6049 | Northeast Plateau | 2282010000 | 1.19667E-05 | 0 | 9999 |
| 6049 | Northeast Plateau | 2282020000 | 5.42328E-08 | 0 | 9999 |
| 6051 | Great Basin Valley | 2282005000 | 0.001038931 | 0 | 9999 |
| 6051 | Great Basin Valley | 2282010000 | 8.59831E-05 | 0 | 9999 |
| 6051 | Great Basin Valley | 2282020000 | 6.68871E-05 | 0 | 9999 |
| 6053 | North CoastC | 2282005000 | 0.026730355 | 0 | 9999 |
| 6053 | North CoastC | 2282010000 | 0.016338462 | 0 | 9999 |
| 6053 | North CoastC | 2282020000 | 0.012654319 | 0 | 9999 |
| 6055 | San Francisco Bay Area | 2282005000 | 0.012806885 | 0 | 9999 |
| 6055 | San Francisco Bay Area | 2282010000 | 0.016338462 | 0 | 9999 |
| 6055 | San Francisco Bay Area | 2282020000 | 0.012654319 | 0 | 9999 |
| 6057 | Mountain Counties | 2282005000 | 0.013602029 | 0 | 9999 |
| 6057 | Mountain Counties | 2282010000 | 0.00561821 | 0 | 9999 |
| 6057 | Mountain Counties | 2282020000 | 2.49471E-05 | 0 | 9999 |
| 6059 | South Coast | 2282005000 | 0.050415479 | 0 | 9999 |
| 6059 | South Coast | 2282010000 | 0.094974845 | 0 | 9999 |
| 6059 | South Coast | 2282020000 | 0.124735428 | 0 | 9999 |
| 6061 | Lake Tahoe | 2282005000 | 0.001728436 | 0 | 9999 |
| 6061 | Lake Tahoe | 2282010000 | 0.002917106 | 0 | 9999 |
| 6061 | Lake Tahoe | 2282020000 | 0.002374603 | 0 | 9999 |
| 6061 | Mountain Counties | 2282005000 | 0.002527954 | 0 | 9999 |
| 6061 | Mountain Counties | 2282010000 | 0.004266463 | 0 | 9999 |
| 6061 | Mountain Counties | 2282020000 | 0.003473015 | 0 | 9999 |
| 6061 | Sacramento Valley | 2282005000 | 0.019428734 | 0 | 9999 |
| 6061 | Sacramento Valley | 2282010000 | 0.032790144 | 0 | 9999 |
| 6061 | Sacramento Valley | 2282020000 | 0.026692059 | 0 | 9999 |
| 6063 | Mountain Counties | 2282005000 | 0.009010498 | 0 | 9999 |
| 6063 | Mountain Counties | 2282010000 | 0.005699189 | 0 | 9999 |
| 6063 | Mountain Counties | 2282020000 | 2.56702E-05 | 0 | 9999 |
| 6065 | South Coast | 2282005000 | 0.012249514 | 0 | 9999 |
| 6065 | South Coast | 2282010000 | 0.016759344 | 0 | 9999 |
| 6065 | South Coast | 2282020000 | 0.022341659 | 0 | 9999 |
| 6065 | Southeast Desert | 2282005000 | 0.009556026 | 0 | 9999 |
| 6065 | Southeast Desert | 2282010000 | 0.013074211 | 0 | 9999 |

**Appendix C (Continued)**

**Allocation Data for Pleasure Craft**

| | | | | | |
|---|---|---|---|---|---|
| 6065 | Southeast Desert | 2282020000 | 0.017429057 | 0 | 9999 |
| 6067 | Sacramento Valley | 2282005000 | 0.01601622 | 0 | 9999 |
| 6067 | Sacramento Valley | 2282010000 | 0.04179791 | 0 | 9999 |
| 6067 | Sacramento Valley | 2282020000 | 0.032539677 | 0 | 9999 |

| | | | | | |
|---|---|---|---|---|---|
| 6069 | North CoastC | 2282005000 | 5.99064E-05 | 0 | 9999 |
| 6069 | North CoastC | 2282010000 | 8.59831E-05 | 0 | 9999 |
| 6069 | North CoastC | 2282020000 | 6.68871E-05 | 0 | 9999 |
| 6071 | South Coast | 2282005000 | 0.069327466 | 0 | 9999 |
| 6071 | South Coast | 2282010000 | 0.046927859 | 0 | 9999 |
| 6071 | South Coast | 2282020000 | 0.061096548 | 0 | 9999 |
| 6071 | Southeast Desert | 2282005000 | 0.045545388 | 0 | 9999 |
| 6071 | Southeast Desert | 2282010000 | 0.030829737 | 0 | 9999 |
| 6071 | Southeast Desert | 2282020000 | 0.040138002 | 0 | 9999 |
| 6073 | San Diego | 2282005000 | 0.073593066 | 0 | 9999 |
| 6073 | San Diego | 2282010000 | 0.121317839 | 0 | 9999 |
| 6073 | San Diego | 2282020000 | 0.159082864 | 0 | 9999 |
| 6075 | San Francisco Bay Area | 2282005000 | 0.014013135 | 0 | 9999 |
| 6075 | San Francisco Bay Area | 2282010000 | 0.009650796 | 0 | 9999 |
| 6075 | San Francisco Bay Area | 2282020000 | 0.007231039 | 0 | 9999 |
| 6077 | San Joaquin Valley | 2282005000 | 0.028083791 | 0 | 9999 |
| 6077 | San Joaquin Valley | 2282010000 | 0.0540121 | 0 | 9999 |
| 6077 | San Joaquin Valley | 2282020000 | 0.041578476 | 0 | 9999 |
| 6079 | South CoastC | 2282005000 | 0.017075283 | 0 | 9999 |
| 6079 | South CoastC | 2282010000 | 0.006889438 | 0 | 9999 |
| 6079 | South CoastC | 2282020000 | 0.009038799 | 0 | 9999 |
| 6081 | San Francisco Bay Area | 2282005000 | 0.011285962 | 0 | 9999 |
| 6081 | San Francisco Bay Area | 2282010000 | 0.002871128 | 0 | 9999 |
| 6081 | San Francisco Bay Area | 2282020000 | 0.002241622 | 0 | 9999 |
| 6083 | South CoastC | 2282005000 | 0.006662287 | 0 | 9999 |
| 6083 | South CoastC | 2282010000 | 0.001682092 | 0 | 9999 |
| 6083 | South CoastC | 2282020000 | 0.002205467 | 0 | 9999 |
| 6085 | San Francisco Bay Area | 2282005000 | 0.002543613 | 0 | 9999 |
| 6085 | San Francisco Bay Area | 2282010000 | 0.014276326 | 0 | 9999 |
| 6085 | San Francisco Bay Area | 2282020000 | 0.012654319 | 0 | 9999 |
| 6087 | North CoastC | 2282005000 | 0.00119593 | 0 | 9999 |
| 6087 | North CoastC | 2282010000 | 0.001334361 | 0 | 9999 |
| 6087 | North CoastC | 2282020000 | 0.001048501 | 0 | 9999 |
| 6089 | Sacramento Valley | 2282005000 | 0.030254363 | 0 | 9999 |
| 6089 | Sacramento Valley | 2282010000 | 0.028646241 | 0 | 9999 |
| 6089 | Sacramento Valley | 2282020000 | 0.000126543 | 0 | 9999 |
| 6091 | Mountain Counties | 2282005000 | 0.008208587 | 0 | 9999 |
| 6091 | Mountain Counties | 2282010000 | 0.001249575 | 0 | 9999 |
| 6091 | Mountain Counties | 2282020000 | 0.000940035 | 0 | 9999 |

**Appendix C (Continued)**

**Allocation Data for Pleasure Craft**

| | | | | | |
|---|---|---|---|---|---|
| 6093 | Northeast Plateau | 2282005000 | 0.001889058 | 0 | 9999 |
| 6093 | Northeast Plateau | 2282010000 | 0.000205904 | 0 | 9999 |
| 6093 | Northeast Plateau | 2282020000 | 7.77337E-07 | 0 | 9999 |
| 6095 | San Francisco Bay Area | 2282005000 | 0.013289325 | 0 | 9999 |
| 6095 | San Francisco Bay Area | 2282010000 | 0.005169672 | 0 | 9999 |
| 6095 | San Francisco Bay Area | 2282020000 | 0.00387985 | 0 | 9999 |

| | | | | | |
|---|---|---|---|---|---|
| 6095 | Sacramento Valley | 2282005000 | 0.017670516 | 0 | 9999 |
| 6095 | Sacramento Valley | 2282010000 | 0.006873996 | 0 | 9999 |
| 6095 | Sacramento Valley | 2282020000 | 0.005158949 | 0 | 9999 |
| 6097 | North Coast | 2282005000 | 0.008269066 | 0 | 9999 |
| 6097 | North Coast | 2282010000 | 0.009939025 | 0 | 9999 |
| 6097 | North Coast | 2282020000 | 0.007220327 | 0 | 9999 |
| 6097 | San Francisco Bay Area | 2282005000 | 0.008293603 | 0 | 9999 |
| 6097 | San Francisco Bay Area | 2282010000 | 0.009968518 | 0 | 9999 |
| 6097 | San Francisco Bay Area | 2282020000 | 0.007241752 | 0 | 9999 |
| 6099 | San Joaquin Valley | 2282005000 | 0.008036024 | 0 | 9999 |
| 6099 | San Joaquin Valley | 2282010000 | 0.002632396 | 0 | 9999 |
| 6099 | San Joaquin Valley | 2282020000 | 0.002097001 | 0 | 9999 |
| 6101 | Sacramento Valley | 2282005000 | 0.000134176 | 0 | 9999 |
| 6101 | Sacramento Valley | 2282010000 | 0.000585647 | 0 | 9999 |
| 6101 | Sacramento Valley | 2282020000 | 0.000495326 | 0 | 9999 |
| 6103 | Sacramento Valley | 2282005000 | 0.002271911 | 0 | 9999 |
| 6103 | Sacramento Valley | 2282010000 | 0.000548671 | 0 | 9999 |
| 6103 | Sacramento Valley | 2282020000 | 2.62125E-06 | 0 | 9999 |
| 6105 | North Coast | 2282005000 | 0.010372393 | 0 | 9999 |
| 6105 | North Coast | 2282010000 | 0.001846563 | 0 | 9999 |
| 6105 | North Coast | 2282020000 | 8.3157E-06 | 0 | 9999 |
| 6107 | San Joaquin Valley | 2282005000 | 0.005286858 | 0 | 9999 |
| 6107 | San Joaquin Valley | 2282010000 | 0.011485304 | 0 | 9999 |
| 6107 | San Joaquin Valley | 2282020000 | 0.009038799 | 0 | 9999 |
| 6109 | Mountain Counties | 2282005000 | 0.019267849 | 0 | 9999 |
| 6109 | Mountain Counties | 2282010000 | 0.040608216 | 0 | 9999 |
| 6109 | Mountain Counties | 2282020000 | 0.032539677 | 0 | 9999 |
| 6111 | South CoastC | 2282005000 | 0.014474995 | 0 | 9999 |
| 6111 | South CoastC | 2282010000 | 0.022057717 | 0 | 9999 |
| 6111 | South CoastC | 2282020000 | 0.030731917 | 0 | 9999 |
| 6113 | Sacramento Valley | 2282005000 | 0.006317161 | 0 | 9999 |
| 6113 | Sacramento Valley | 2282010000 | 0.008055814 | 0 | 9999 |
| 6113 | Sacramento Valley | 2282020000 | 0.007176806 | 0 | 9999 |
| 6115 | Sacramento Valley | 2282005000 | 0.012067571 | 0 | 9999 |
| 6115 | Sacramento Valley | 2282010000 | 0.011585556 | 0 | 9999 |
| 6115 | Sacramento Valley | 2282020000 | 5.2425E-05 | 0 | 9999 |

**Appendix D**
**Temporal Profiles (Appendix H of SAI's Report)**

Activity Profiles by Month and Region

| | North | Central | South |
|---|---|---|---|
| January | 3 | 2.86 | 3.24 |
| February | 3 | 2.86 | 3.24 |
| March | 3 | 2.86 | 3.24 |
| April | 12.77 | 12.79 | 11.84 |
| May | 12.77 | 12.79 | 11.84 |
| June | 14.56 | 14.82 | 15 |
| July | 14.56 | 14.82 | 15 |
| August | 14.56 | 14.82 | 15 |
| September | 12.77 | 12.79 | 11.84 |
| October | 3 | 2.86 | 3.24 |
| November | 3 | 2.86 | 3.24 |
| December | 3 | 2.86 | 3.24 |

Annual Average Weekly Profile

| | |
|---|---|
| Monday | 0.0527578 |
| Tuesday | 0.0621816 |
| Wednesday | 0.0702681 |
| Thursday | 0.0723208 |
| Friday | 0.1043395 |
| Saturday | 0.3039638 |
| Sunday | 0.3341683 |

## Appendix E
## US EPA's Equation for $HC+NO_x$ Emission Standard

(Refer to the Federal Register: / Volume 61, Number 194 / October 4, 1996 / Rules and Regulations / Page 52091 for a detailed information of this page).

The following formulas and tables summarize the $HC+NO_X$ emission standard for each rated power of the engine family as finalized for OB/PWC:

$$HC_{base} = (151 + 557/p^{0.9}) \quad \text{or} \quad 300 \text{ g/kw-hr, whichever is lower, where}$$

$HC_{base}$ = hydrocarbon base average level in g/kw-hr
P = rated power of the engine family in kilowatt (kw).

$$NO_X = 2.0 \text{ g/kw-hr, where}$$

$NO_X$base = oxides of nitrogen base average level

To determine the $HC+NO_X$ level for the base year, $HC_{base}$ and $NO_{Xbase}$ are added. HC and $NO_X$ are both changed to their final year level in equal increments. To calculate the $HC+NO_X$ standard for a given model year and rated power, use Table 2 and the following equation:

$$HC+NO_X = A*(151 + 557/p^{0.9}) + B, \quad \text{or} \quad HC+NO_X = C, \text{ whichever is lower, where}$$

$HC+NO_X$ = emission standard in a given model year in g/kw-hr
A = hydrocarbon reduction factor based in a given model year.
B = $NO_X$ level factor in a given model year
C = maximum $HC+NO_X$ average, in g/kw-hr, in a given model year

OB/pwc Engines
[Factors for calculation of $HC+NO_X$ emission standard]

| Model year | A | B | C |
|---|---|---|---|
| 1998 | 0.917 | 2.44 | 278 |
| 1999 | 0.833 | 2.89 | 253 |
| 2000 | 0.750 | 3.33 | 228 |
| 2001 | 0.667 | 3.78 | 204 |
| 2002 | 0.583 | 4.22 | 179 |
| 2003 | 0.500 | 4.67 | 155 |
| 2004 | 0.417 | 5.11 | 130 |
| 2005 | 0.333 | 5.56 | 105 |
| 2006 and after | 0.250 | 6.00 | 81 |

The $HC+NO_X$ standard for pwc does not go into effect until 1999. At this time, pwc engines will be required to meet the same standard as OB engines. Initially, OB and pwc are in separate averaging sets; however, beginning in 2001, OB and pwc enter the same averaging set.

**Appendix F**
**Pleasure Craft Emission Factors with US EPA Regulations for Gasoline Engines Only**

| HP Range | Avg. HP | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|---|---|---|---|---|---|---|---|---|---|
| HC+NOx | | | | | | | | | | |
| 0 - 2 | 2 | 207.30 | 188.66 | 170.02 | 152.12 | 133.48 | 115.58 | 96.94 | 78.30 | 60.40 |
| 3 - 15 | 6 | 199.56 | 185.78 | 167.81 | 149.85 | 131.66 | 113.70 | 95.73 | 77.55 | 59.58 |
| 16 - 25 | 20 | 130.91 | 126.35 | 114.30 | 102.26 | 90.07 | 78.03 | 65.98 | 53.79 | 41.75 |
| 26 - 50 | 37 | 118.44 | 113.42 | 102.67 | 91.91 | 81.02 | 70.27 | 59.51 | 48.63 | 37.87 |
| 51 - 120 | 79 | 108.74 | 104.78 | 94.88 | 84.99 | 74.97 | 65.08 | 55.18 | 45.17 | 35.27 |
| 121 - 175 | 145 | 107.25 | 101.06 | 91.54 | 82.02 | 72.37 | 62.85 | 53.32 | 43.69 | 34.16 |
| 176 - 250 | 196 | 107.84 | 99.85 | 90.44 | 81.04 | 71.52 | 62.12 | 52.72 | 43.20 | 33.79 |
| 251 - 500 | 274 | 108.25 | 98.83 | 89.53 | 80.23 | 70.81 | 61.51 | 52.21 | 42.79 | 33.49 |
| HC | | | | | | | | | | |
| 0 - 2 | 2 | 206.66 | 188.08 | 169.49 | 151.65 | 133.07 | 115.22 | 96.64 | 78.06 | 60.21 |
| 3 - 15 | 6 | 198.44 | 182.55 | 164.89 | 147.24 | 128.91 | 110.88 | 92.67 | 74.27 | 55.28 |
| 16 - 25 | 20 | 129.31 | 118.94 | 107.60 | 96.27 | 84.78 | 73.45 | 62.11 | 48.31 | 37.49 |
| 26 - 50 | 37 | 117.34 | 105.79 | 95.75 | 85.72 | 75.57 | 65.54 | 54.25 | 42.62 | 30.35 |
| 51 - 120 | 79 | 107.03 | 100.17 | 90.71 | 81.26 | 70.98 | 60.70 | 50.23 | 38.52 | 27.38 |
| 121 - 175 | 145 | 106.16 | 98.44 | 89.16 | 79.40 | 69.82 | 59.04 | 50.09 | 33.61 | 26.28 |
| 176 - 250 | 196 | 106.71 | 96.10 | 87.05 | 78.00 | 68.09 | 58.67 | 48.41 | 46.68 | 22.45 |
| 251 - 500 | 274 | 106.43 | 97.17 | 87.80 | 78.69 | 69.45 | 60.33 | 51.20 | 41.97 | 32.84 |
| NOx | | | | | | | | | | |
| 0 - 2 | 2 | 1.10 | 1.00 | 0.90 | 0.81 | 0.71 | 0.61 | 0.51 | 0.42 | 0.32 |
| 3 - 15 | 6 | 1.13 | 3.04 | 2.75 | 2.45 | 2.58 | 2.64 | 2.79 | 2.97 | 3.87 |
| 16 - 25 | 20 | 1.60 | 7.33 | 6.63 | 5.94 | 5.23 | 4.53 | 3.83 | 5.43 | 4.21 |
| 26 - 50 | 37 | 1.10 | 7.64 | 6.91 | 6.19 | 5.46 | 4.73 | 5.26 | 6.01 | 7.52 |
| 51 - 120 | 79 | 1.71 | 4.61 | 4.17 | 3.74 | 3.99 | 4.38 | 4.96 | 6.65 | 7.89 |
| 121 - 175 | 145 | 1.09 | 2.62 | 2.38 | 2.62 | 2.55 | 3.81 | 3.24 | 10.07 | 7.88 |
| 176 - 250 | 196 | 1.13 | 3.75 | 3.40 | 3.04 | 3.43 | 3.45 | 4.31 | 4.94 | 11.34 |
| 251 - 500 | 274 | 1.82 | 1.66 | 1.72 | 1.55 | 1.36 | 1.18 | 1.01 | 0.82 | 0.65 |
| CO | | | | | | | | | | |
| 0 - 2 | 2 | 277.39 | 252.45 | 227.51 | 203.56 | 178.61 | 154.66 | 129.72 | 104.78 | 80.82 |
| 3 - 15 | 6 | 319.75 | 294.15 | 265.70 | 237.26 | 207.72 | 178.66 | 149.32 | 119.68 | 89.07 |
| 16 - 25 | 20 | 276.00 | 253.86 | 229.66 | 205.47 | 180.96 | 156.78 | 132.57 | 103.11 | 80.02 |
| 26 - 50 | 37 | 207.67 | 187.22 | 169.46 | 151.72 | 133.74 | 115.99 | 96.02 | 75.43 | 53.71 |
| 51 - 120 | 79 | 212.58 | 198.96 | 180.17 | 161.39 | 140.98 | 120.57 | 99.76 | 76.51 | 54.38 |
| 121 - 175 | 145 | 243.72 | 225.99 | 204.69 | 182.28 | 160.29 | 135.54 | 114.99 | 77.17 | 60.34 |
| 176 - 250 | 196 | 215.19 | 193.79 | 175.54 | 157.29 | 137.31 | 118.32 | 97.62 | 94.14 | 45.28 |
| 251 - 500 | 274 | 204.68 | 186.88 | 168.86 | 151.33 | 133.56 | 116.02 | 98.47 | 80.72 | 63.17 |

## Appendix G
## Emission Factors for Gasoline Powered Boats in California Used for 1994 SIP Emissions Inventory (pounds/1000 gallon)

| Waterway/ Vessel Type | TOG | NOx | CO |
|---|---|---|---|
| Lakes | 672 | 59 | 2430 |
| Rivers | 564 | 72 | 2210 |
| Delta | 564 | 72 | 2210 |
| Coast | 311 | 96 | 1822 |

Source: Emissions Inventory Procedural Manual; Volume III; Methods for Assessing Area Source Emissions, Section 8.3; dated September 1995

## Current Emission factors for Gasoline Powered Boats in California (pounds/1000 gallon)

| Engine Type | Propulsion Type | TOG | NOx | CO |
|---|---|---|---|---|
| 2-Stroke | PWC | 2210 | 12.8 | 4030 |
| 4-Stroke | All | 151 | 101 | 3233 |

Source:A report by SAI entitled "Development of an Improved Inventory of Emissions from Pleasure Craft in California", dated June 1995

**Appendix H**
**Comments and changes made to Mail Out #MSC98-14**

In response to the Air Resources Board Mail Out #MSC 98-14, which described details of various input factors and methodologies used to derive the emissions inventory of pleasure craft, the following organizations submitted comments: 1) Ventura County Air Pollution Control District (VCAPCD), (2) Outboard Marine Corporation (OMC), (3) California Motor Cycle Dealers Association (CMDA); and (4) National Marine Manufacturers Association (NMMA). Staff appreciates receiving these written comments and the significant changes staff has incorporated into the revised inventory based upon the comments received are decribed below. Copies of the comments submitted by each organization are attached at the end of this document.

## VCAPCD Comments

Equipment Types

1. *It is assumed the pleasure craft category population consists of only the recreational boats registered by the California Department of Motor Vehicles (DMV), and not the commercial boats as stated.*

   Yes, the pleasure craft category population consists of only the recreational boats registered by the DMV.

Population

*Growth and Scrappage*

2. *Statewide growth factors are stated as being the same for all engine and fuel types in a given equipment classification. However, in the discussion of increased $NO_x$ emissions in year 2010, one of the reasons given is a shift away from 2-stroke to 4-stroke technology. …. Should the growth factors be more specific to reflect anticipated changes in engine configuration or fuel type?*

   Yes, the growth factors should be more specific to reflect the anticipated changes in engine configuration or fuel type. However, the OFFROAD model currently can not handle these changes. Currently, the anticipated changes are taken care by adjusting the model year emission rates.

3. *In Appendix B, Why is the population of outboard engines expected to decrease by 8.4% between 1990 and 2010, while the population of inboard and inboard/outboard engines is expected to increase by 37-42%?*

The trend of the population growth from 1990 to 1997 calendar years for DMV registered boats was used to determine the population growth for future years resulting in the decrease of outboard population and the increase in inboard and inboard/outboard engines.

Activity

3. *What is the definition of the ASC codes in appendix C?*

   The ASC code is a ten-character description code used in the OFFROAD model. The first two characters indicate that it is an off-road mobile source; the third and fourth characters indicate the category of the off-road equipment (e.g., recreational marine vessels, lawn and garden equipment, etc.), the fifth through seventh characters represent the engine/fuel type of the equipment (e.g., 2 stroke gasoline, 4 stroke gasoline, diesel, etc.) and the eighth through tenth characters represent the equipment type (e.g., OB, pwc, etc.).

4. *Table 2 contains statewide average pleasure craft utilization in hours/year. Was any consideration given to possible regional differences in annual usage, and to marine versus fresh water usage?*

   Currently, to staff's knowledge, no data is available to consider possible regional and marine versus fresh water differences in annual usage.

Statewide Exhaust Emissions

5. *What is the basis of using deterioration rate based on a 1974 on-road passenger vehicle for four stoke engines. Why were no deterioration rates established for two-stroke gasoline or diesel engines?*

   A 1974 passenger car is equipped with a non-catalyst engine, which is the closest technology to the 4 stroke marine engine. Because of lack of data and after consultation with manufacturers, no deterioration is assumed for either 2 stroke or diesel engines.

6. *The pollutant grand totals in Table 8 are not the sum of the equipment type totals.*

   Staff has corrected the sum of the equipment totals.

Comparison with SIP numbers

7. *Table 8 and 11 indicate substantial increases in 1990 ROG and $NO_x$ emissions. Will the 1990 Federal Clean Air Act base year emission inventory be revised accordingly at the statewide and local level to reflect the emission inventory changes proposed here?*

   Yes, the SIP numbers will be revised once the complete OFFROAD model is finalized and approved by the ARB board.

**NMMA, OMC and CMDA Comments**

1. *NMMA, OMC and CMDA's concern is that the emissions inventory estimates (in particular those of pwc) represented in the proposal documents are based on "staff estimates" that are not derived using scientific methods and thus overestimate the actual emissions for marine engines, causing negative effects among consumers and marine dealers.*

   Since the initial mail out, staff has been reviewing and updating the factors that support the calculations of the emissions inventory. To the greatest extent possible, staff has used the best available recreational marine engine data and has been working in close consultation with NMMA consultants to develop a technically valid emissions inventory that is acceptable to various stakeholders. Changes have been made to the usage, load factor and model year specific rated horsepower of personal watercraft.